Air Monitoring Issues

Luis Lim, NJDEP
Division of Air Quality
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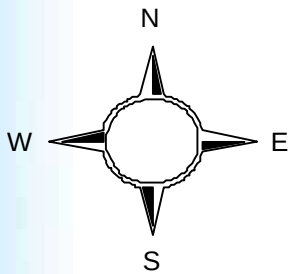
Overview

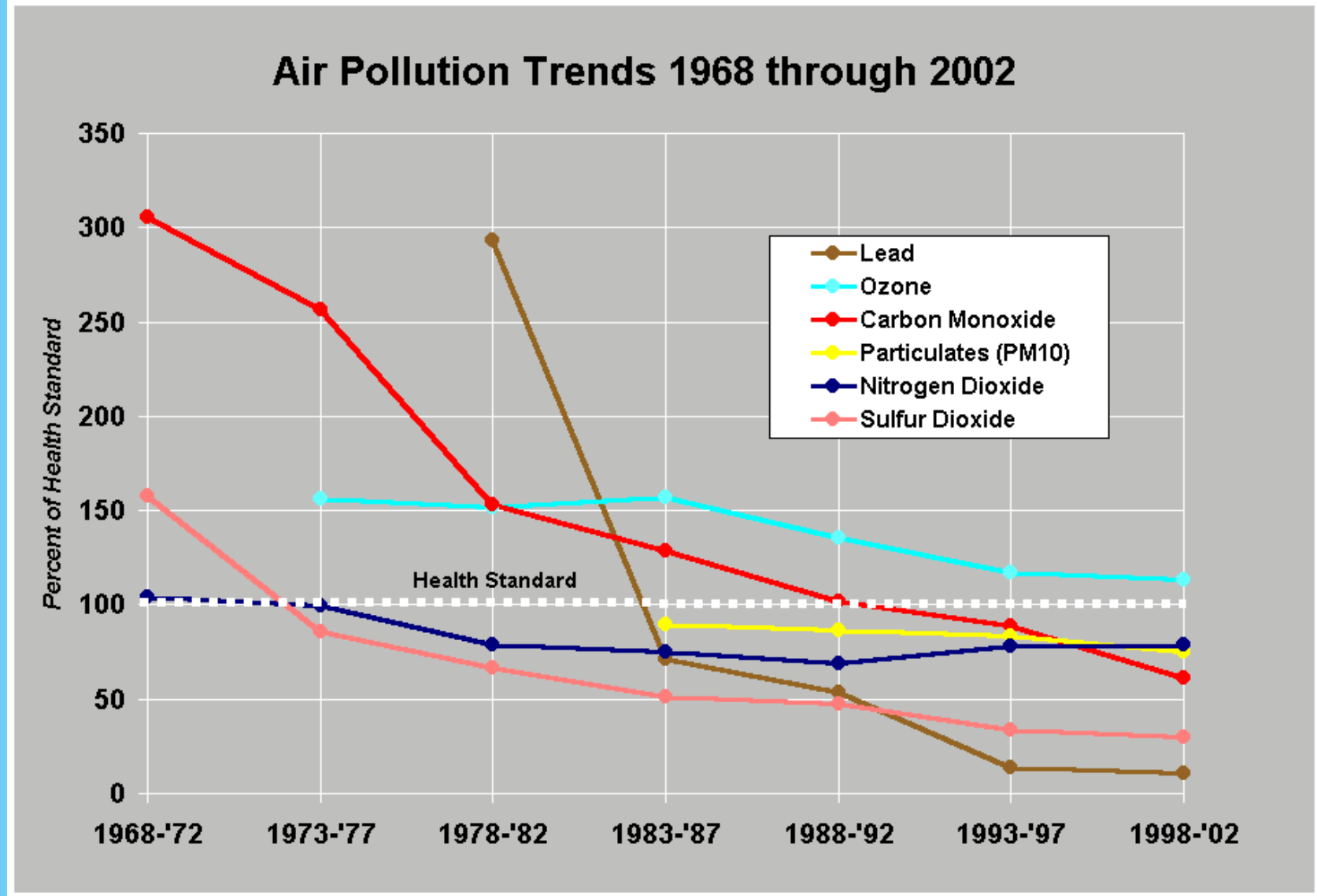
- New Jersey Air Monitoring Network
- Ozone
- Fine Particles ($PM_{2.5}$)
- $PM_{2.5}$ Composition
- Regional Haze

Air Monitoring Networks

- Criteria air pollutants - CO, SO_2, O_3, NO_2, Particulate Matter (PM_{10} & $PM_{2.5}$), and Pb
- Photochemical Assessment Monitoring Stations - measures O_3 Precursors (VOCs)
- Air Toxics - Volatile Organic Compounds (VOCs), Elements, Cations, Anions, Carbon Species
- Acid Precipitation
- Meteorological Measurements

The New Jersey Air Monitoring Network




Air Pollution Trends 1968 through 2002
Percent of Health Standard
350
300
250
200
150
100
50
0
Health Standard
1968-'72
1973-'77
1978-'82
1983-'87
1988-'92
1993-'97
1998-'02
Lead
Ozone
Carbon Monoxide
Particulates (PM10)
Nitrogen Dioxide
Sulfur Dioxide

Pollutants in Attainment

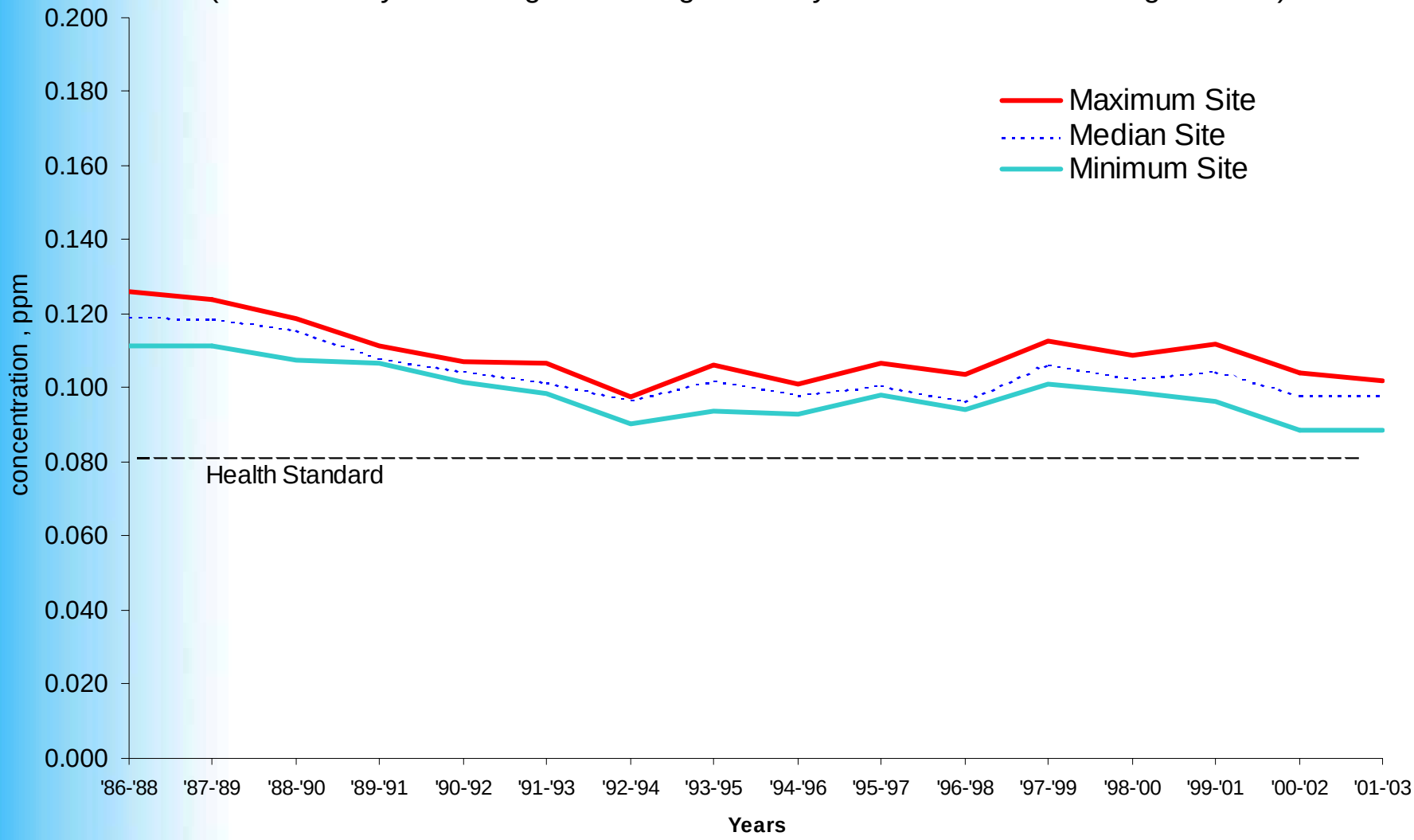
- Lead (Pb)
- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Inhalable Particulates (PM_{10})

Pollutants That Require State Implementation Plans (SIPs)

- Ozone (O_3)
- Fine Particles ($PM_{2.5}$)
- Regional Haze

8-Hour Ozone Air Quality, 1986 - 2003

(Based on 3 year Average of 4th Highest Daily 8-hour Maximum - Design Values)



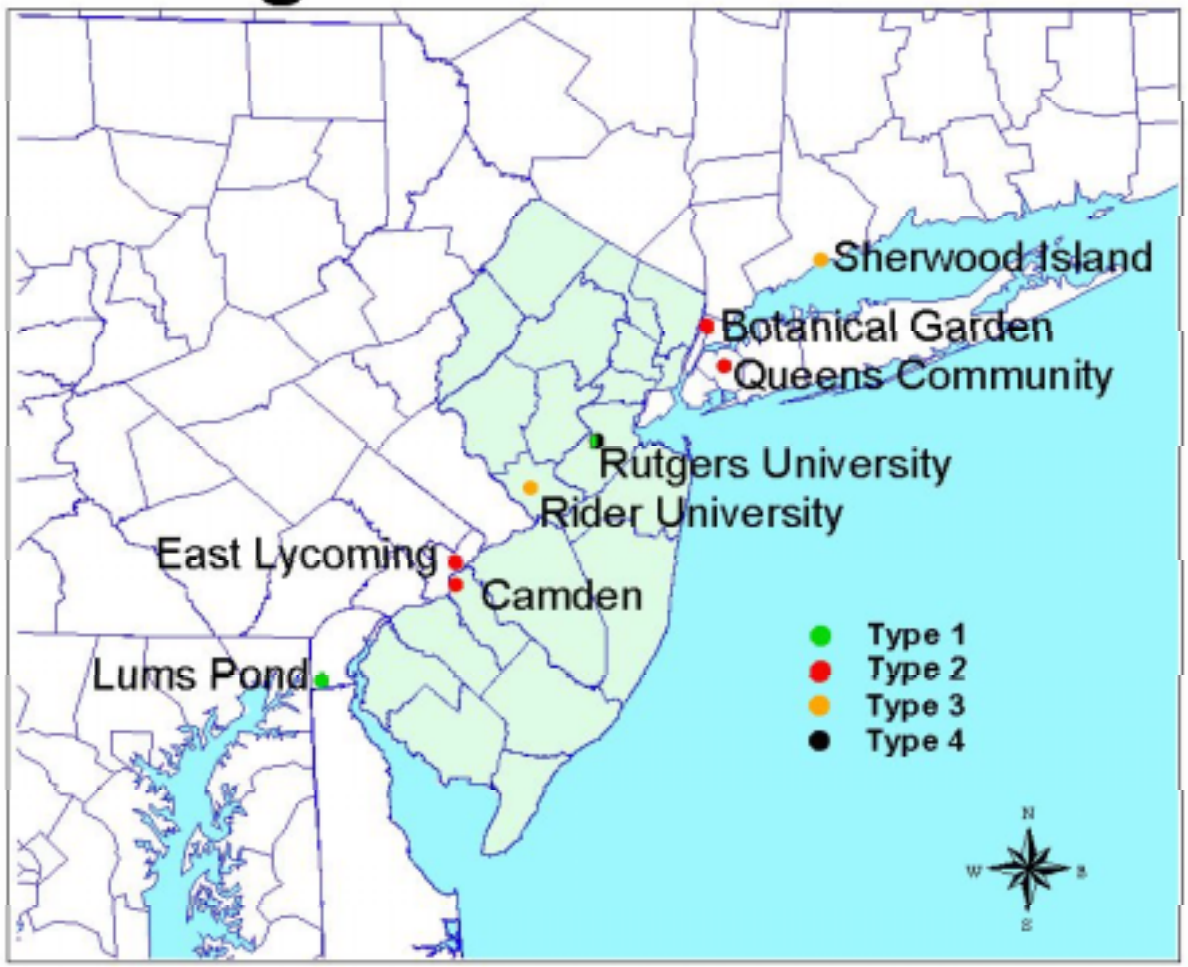
Ozone Affected By

- Sunlight
- Temperature
- Wind Direction
- Ozone Precursors
  - Volatile Organic Compounds (VOCs)
  - Nitrogen Oxides
- Transport of Precursors

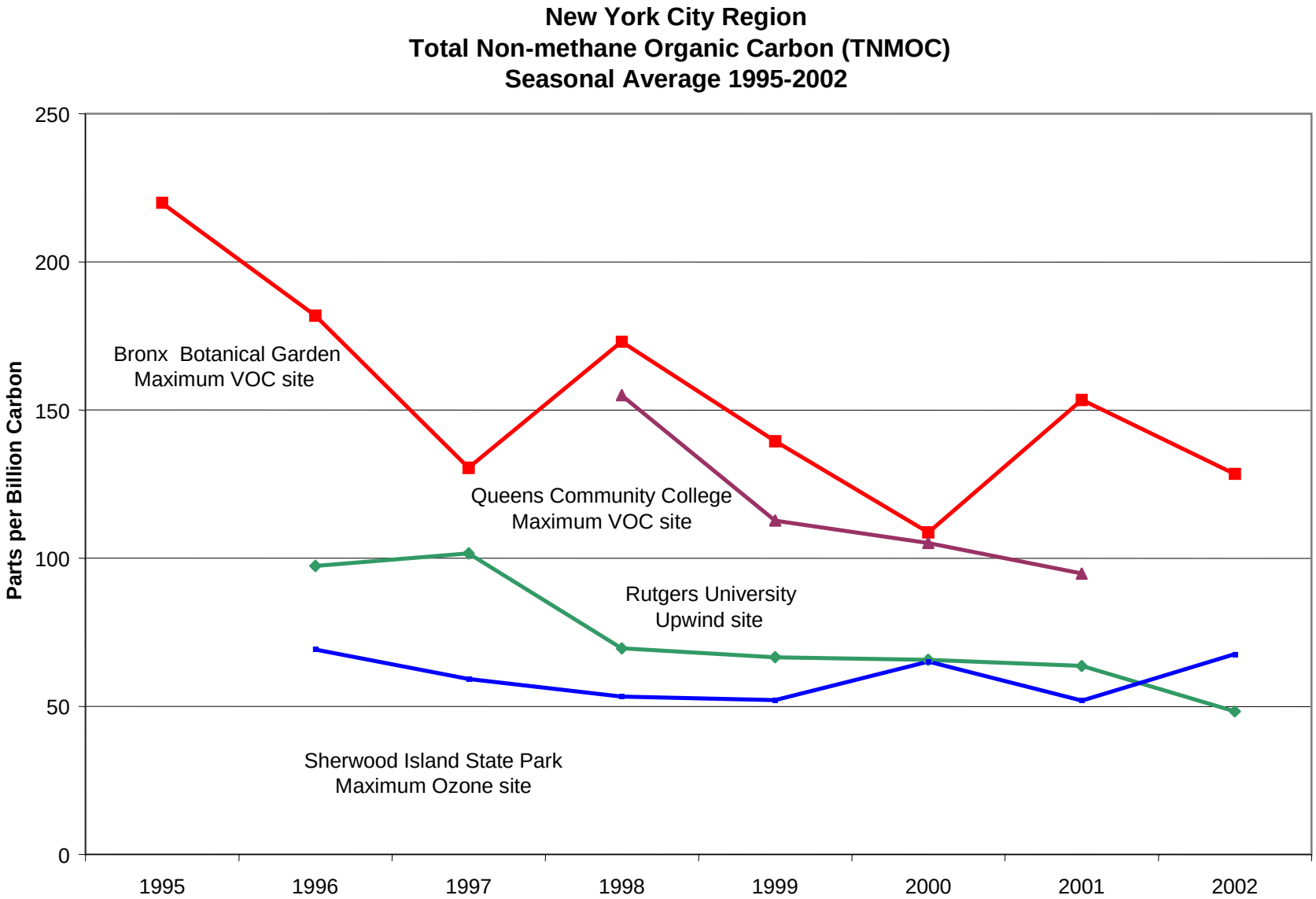
Photochemical Assessment Monitoring Stations (PAMS)

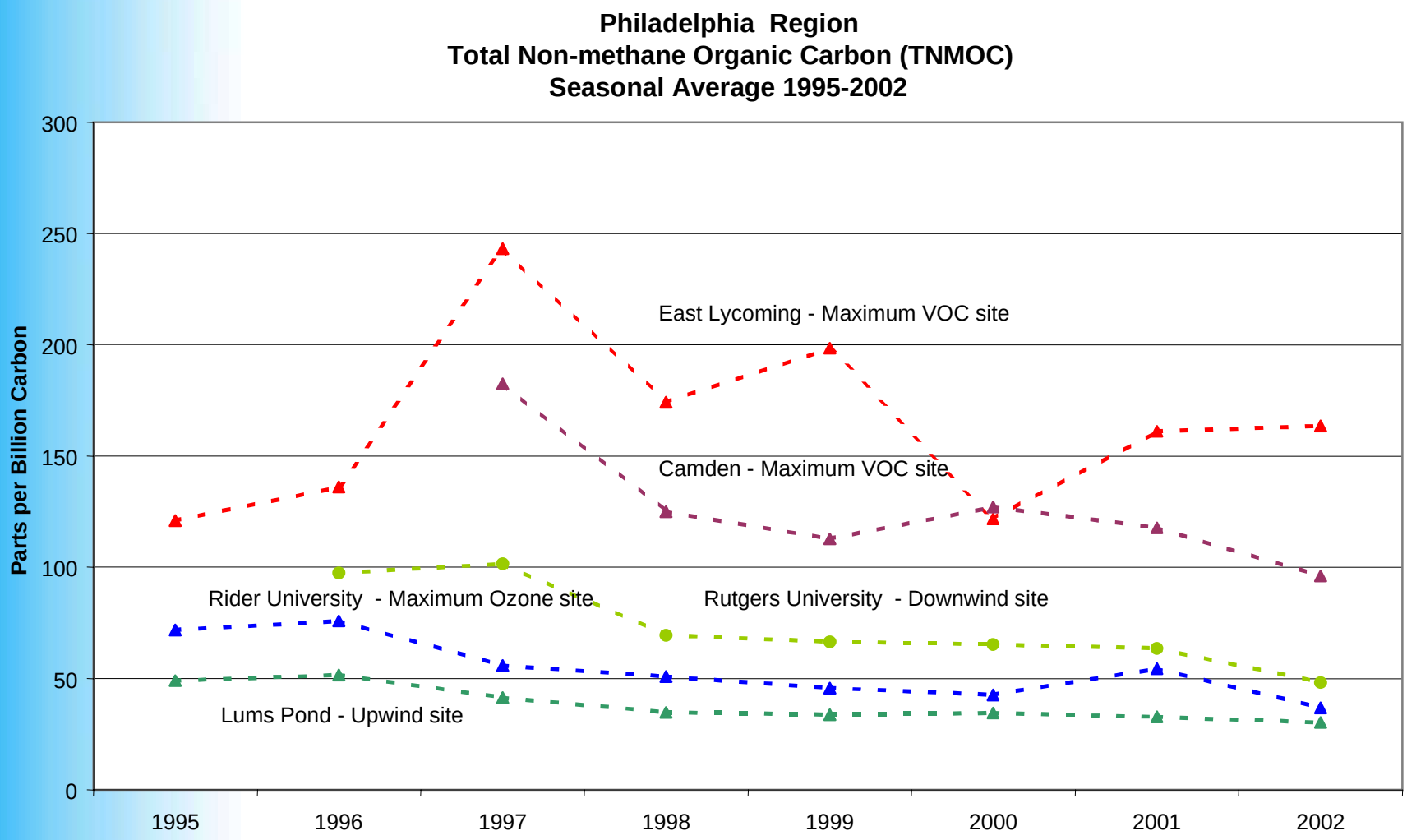
- 3 Stations in New Jersey
  - Camden
  - Rider University
  - Rutgers University
- Ozone Precursors - 55 VOCs
- data since 1995

Regional PAMS Sites

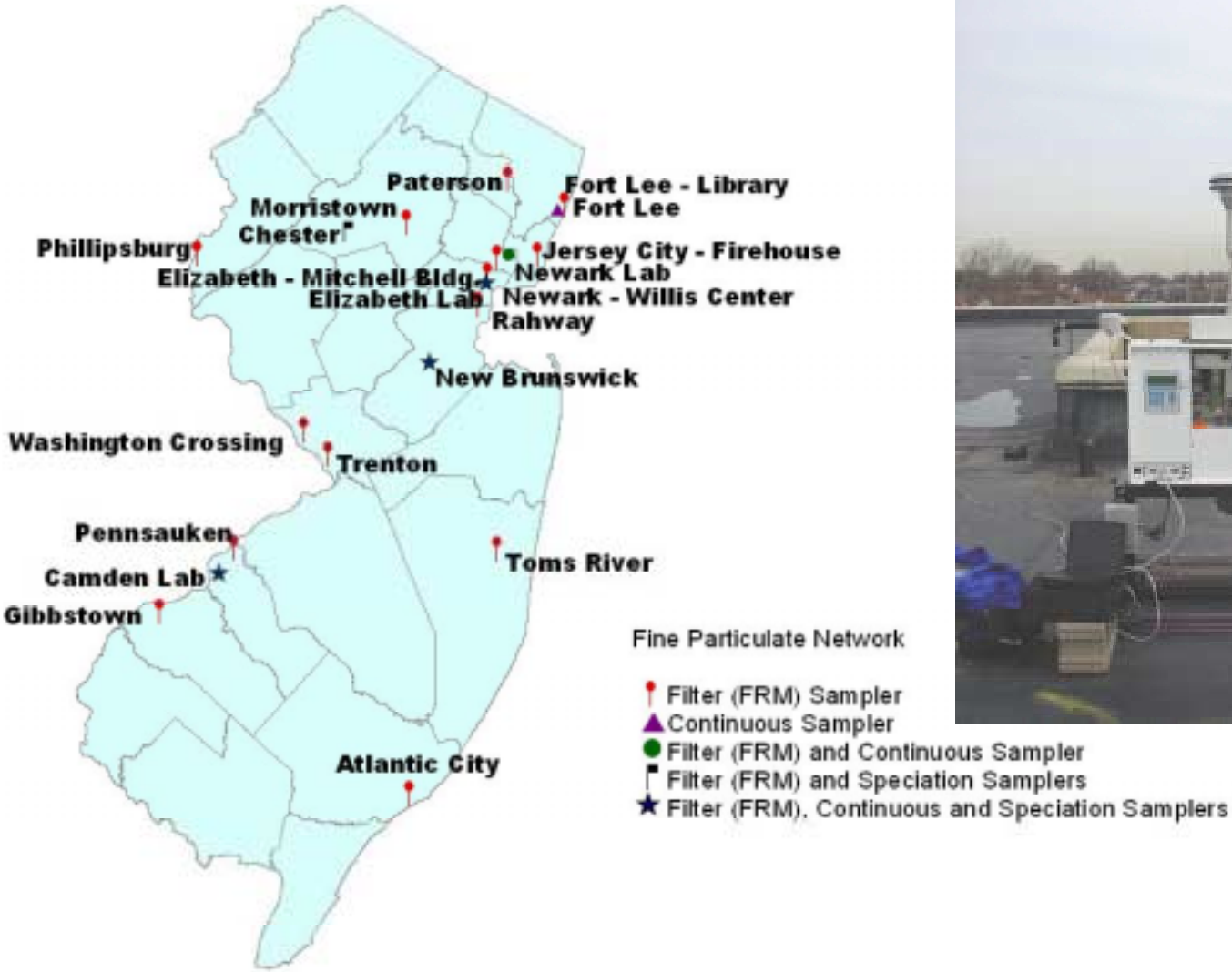


Type
1- Upwind site
2- Max VOC site
3- Max O_3 site
4- Downwind site


New York City Region
Total Non-methane Organic Carbon (TNMOC)
Seasonal Average 1995-2002
Parts per Billion Carbon
250
200
150
100
50
0
1995
1996
1997
1998
1999
2000
2001
2002
Bronx Botanical Garden
Maximum VOC site
Queens Community College
Maximum VOC site
Rutgers University
Upwind site
Sherwood Island State Park
Maximum Ozone site


Philadelphia Region
Total Non-methane Organic Carbon (TNMOC)
Seasonal Average 1995-2002
Parts per Billion Carbon
300
250
200
150
100
50
0
1995
1996
1997
1998
1999
2000
2001
2002
East Lycoming - Maximum VOC site
Camden - Maximum VOC site
Rider University - Maximum Ozone site
Rutgers University - Downwind site
Lums Pond - Upwind site

New Jersey Fine Particle ($PM_{2.5}$) Monitoring Network

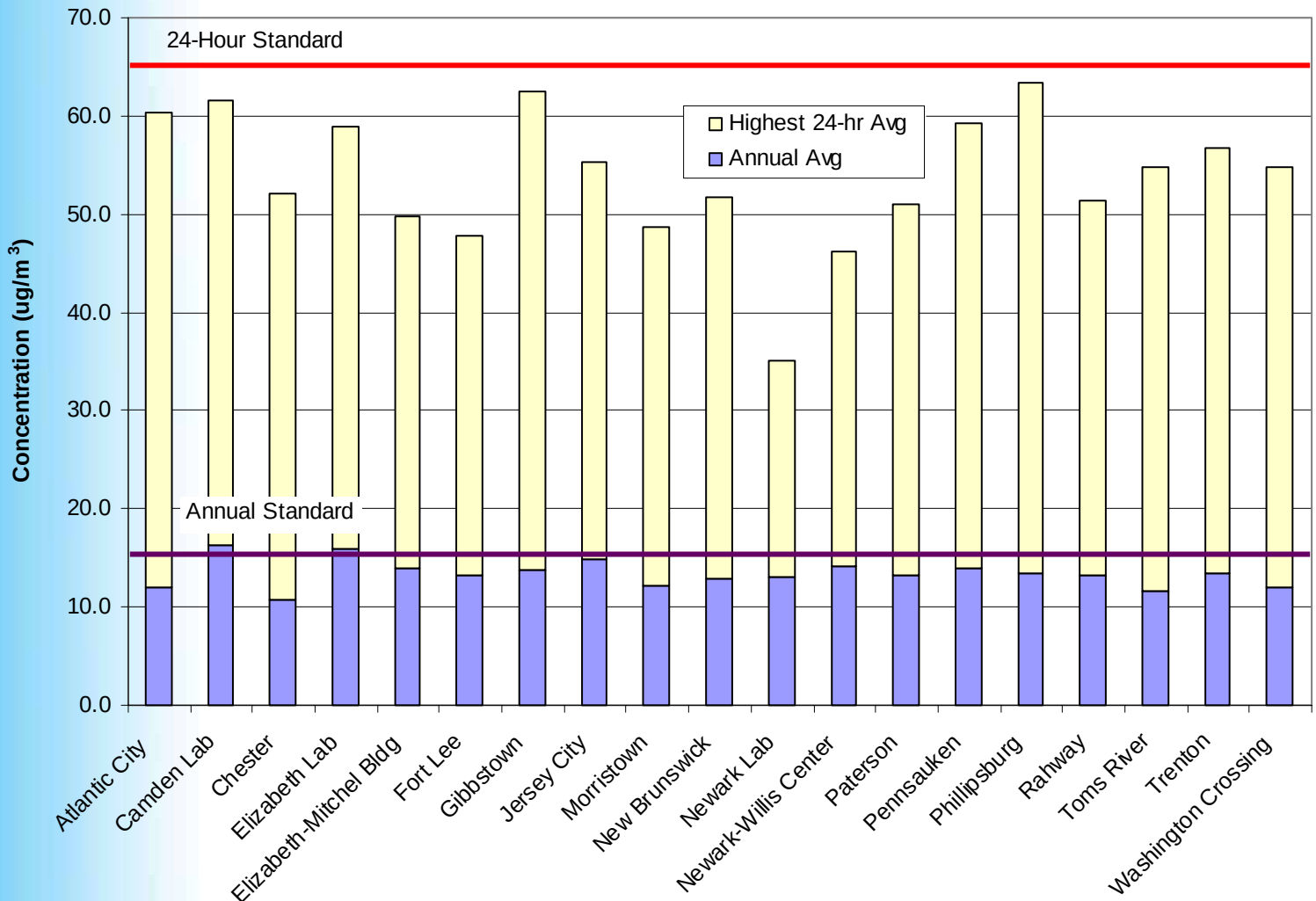


Fine Particles ($PM_{2.5}$)

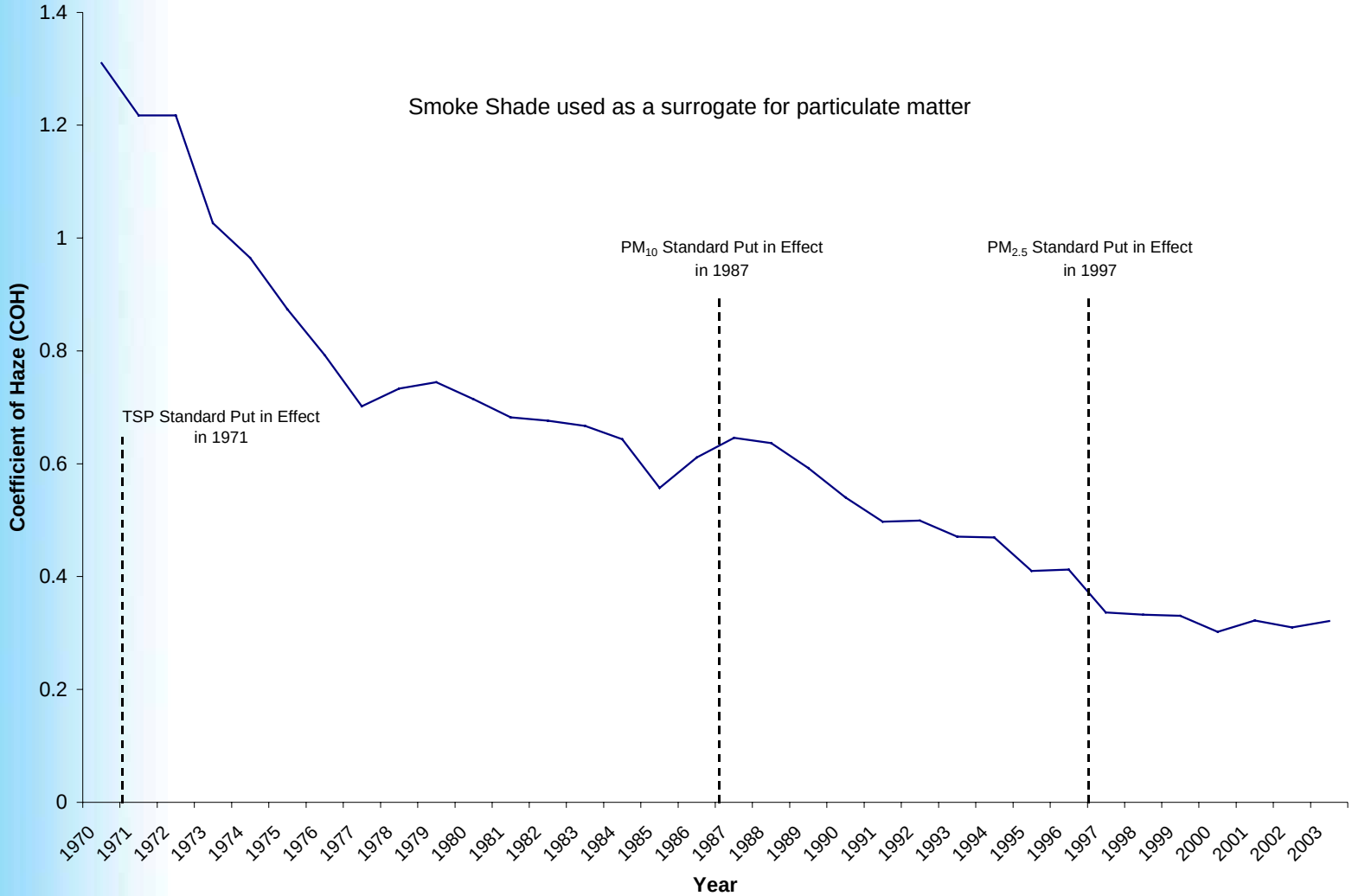
- ≤ 2.5 micrometers in aerodynamic diameter
- mixture
  - soils
  - combustion particles
  - secondary aerosols

Manual Sampler
  Federal Method
  Collected on Filters
Continuous Analyzer
  Not Federal Method
  Real-time values
Speciation Sampler
  composition of PM

2003 Fine Particle ($PM_{2.5}$) Concentrations



Long Term Trend in Haze Levels



Speciation Trends Network

- Monitoring started in 2001 in NJ
- Assess trends in $PM_{2.5}$ mass
- Characterize annual and seasonal spatial variation
- Determine effectiveness of control strategies
- Understand effects of atmospheric conditions on visibility and regional haze

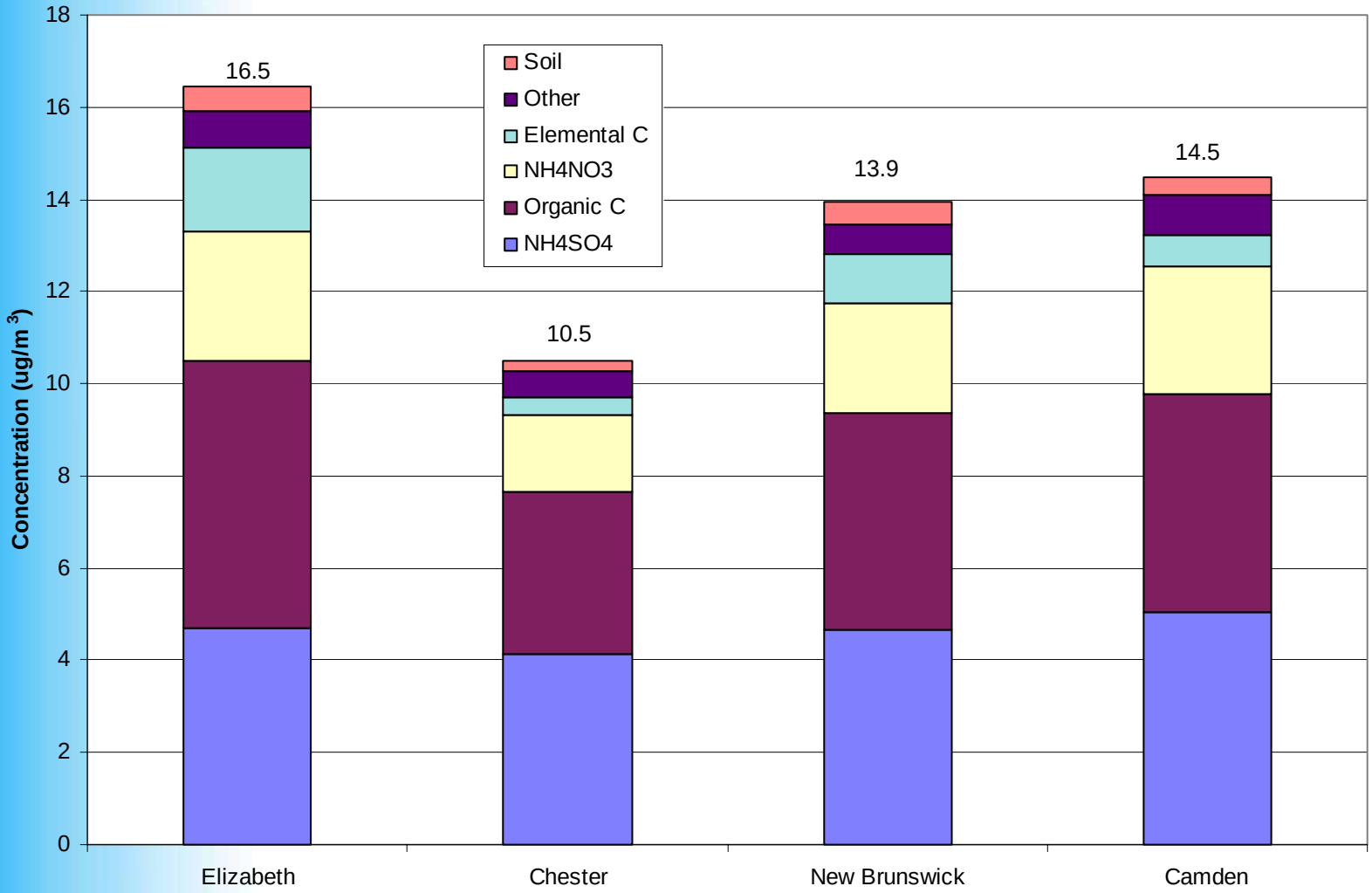
Major Components of $PM_{2.5}$ Mass Concentration

- Soils
- Elemental Carbon
- Organic Carbon
- Ammonium Nitrate
- Ammonium Sulfate

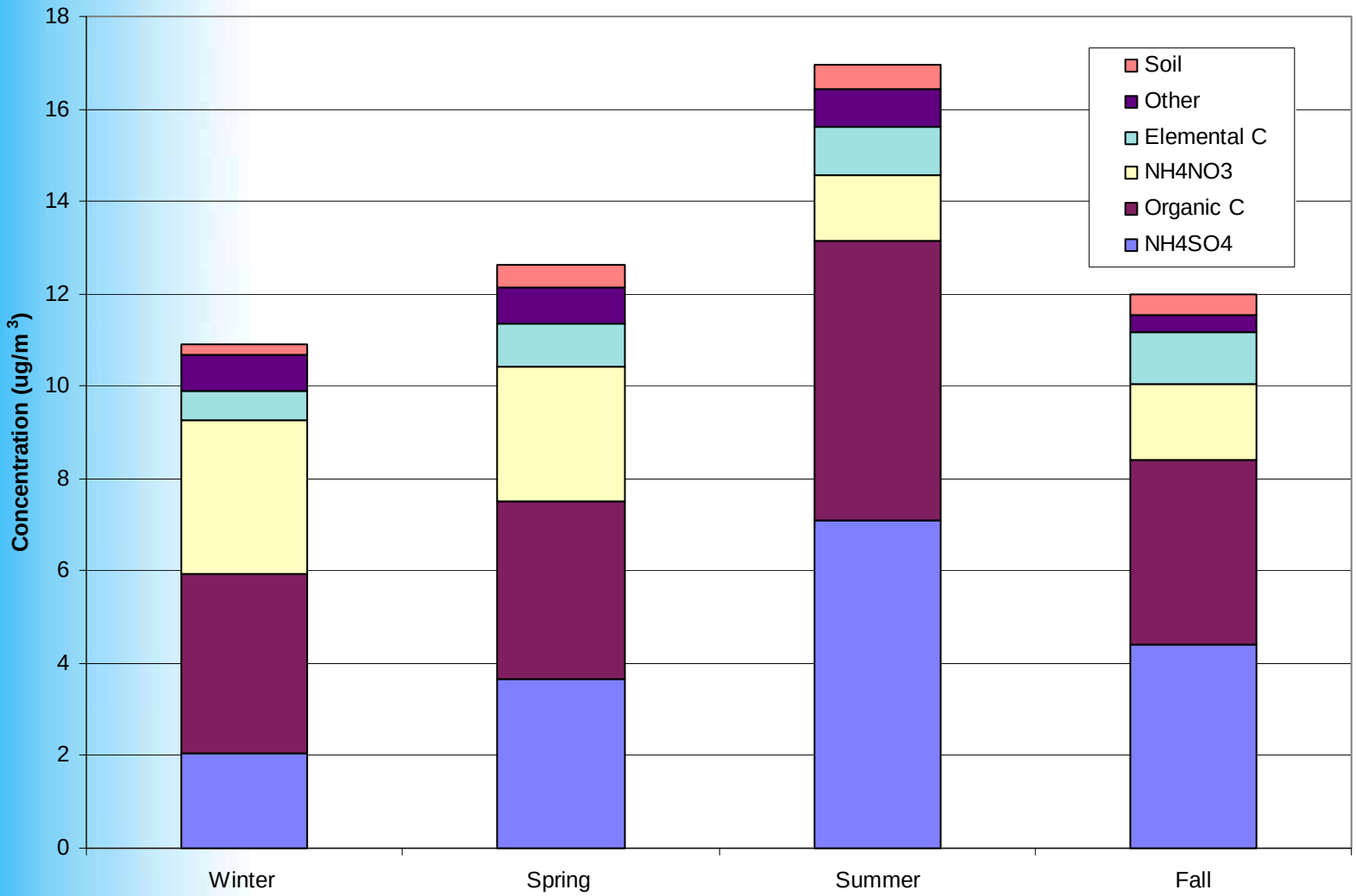
Minor Components

- Trace Metals

$PM_{2.5}$ Components at New Jersey Speciation Sites 2001-2003



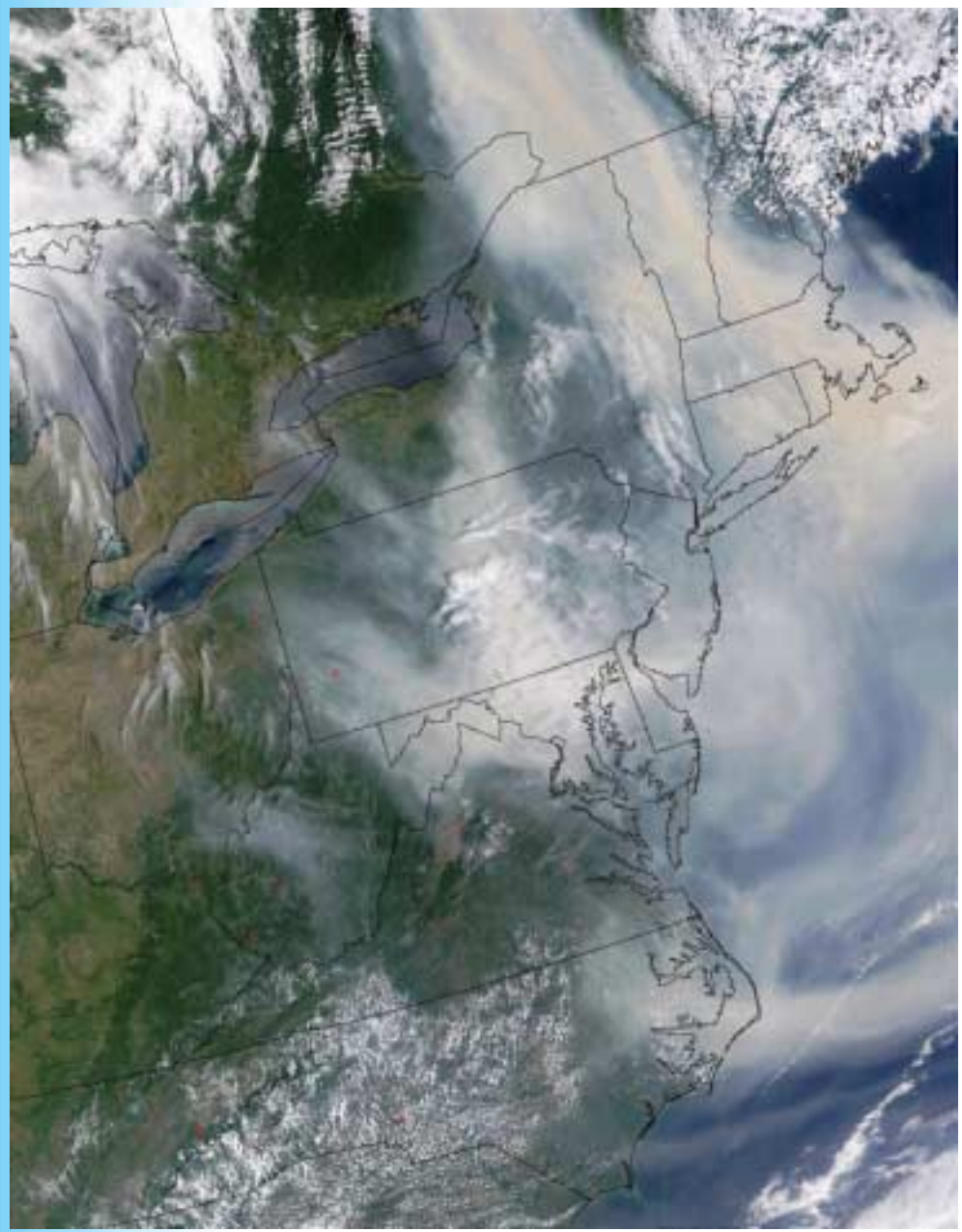
Seasonal Variation of $PM_{2.5}$ Components at New Brunswick in 2001-2003



Comparison of Woodsmoke Contributions to $PM_{2.5}$ Concentrations: Air Quality vs. Inventory Data

- Metro NYC study
  - negligible
- NJ studies
  - negligible
  - <10%
- Northern CA
  - 0% urban area
  - 61% rural/forested
- Northern VT
  - 14.5% annual avg
  - 18.4% winter months

- EPA Inventory of NYC area sites
  - Bronx 6.6%
  - Queens 16.7%
  - Elizabeth 17.3%
  - Chester, NJ 19.7%



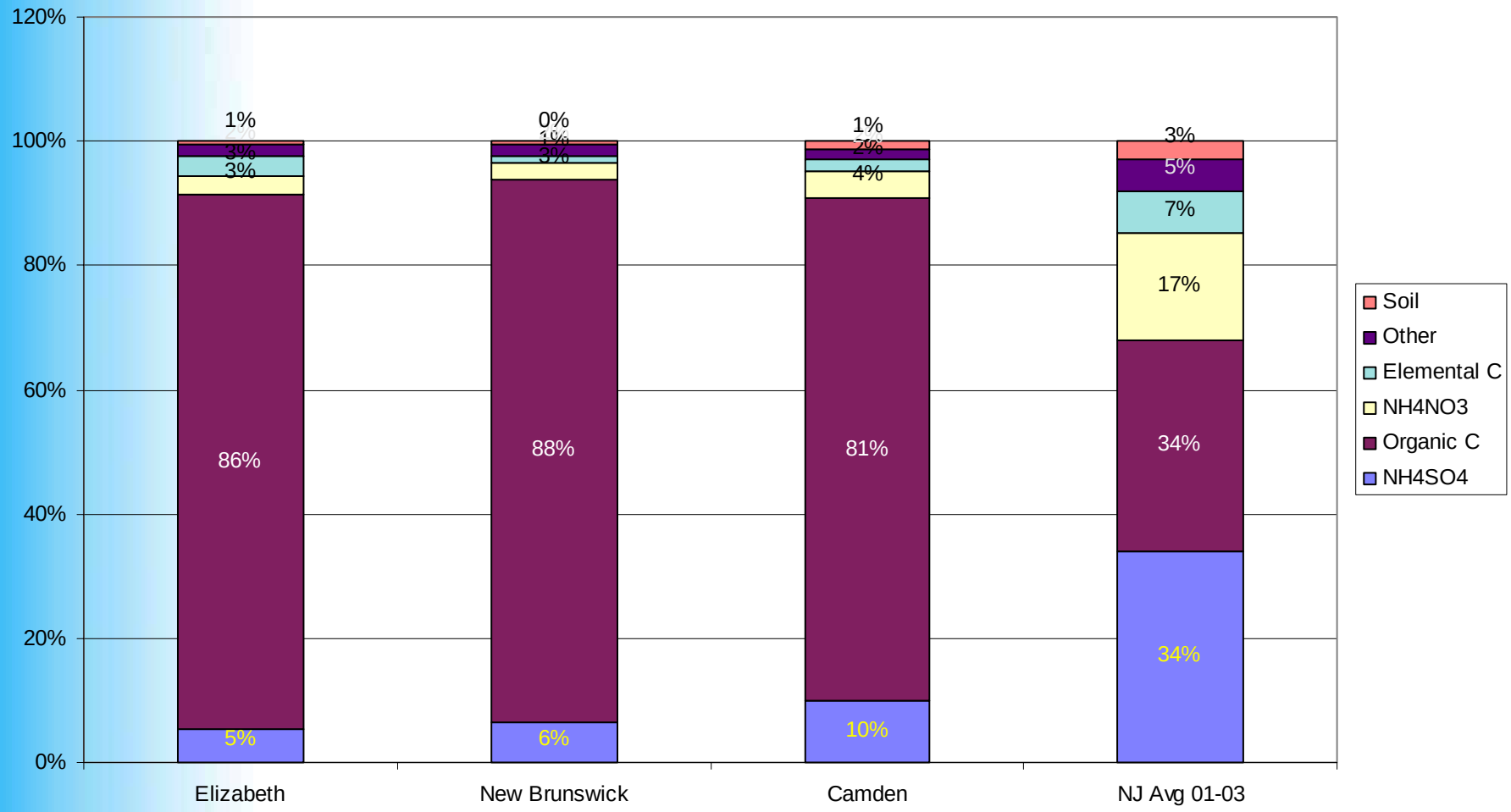
Canadian Forest Fire Episode

July 6-7, 2002

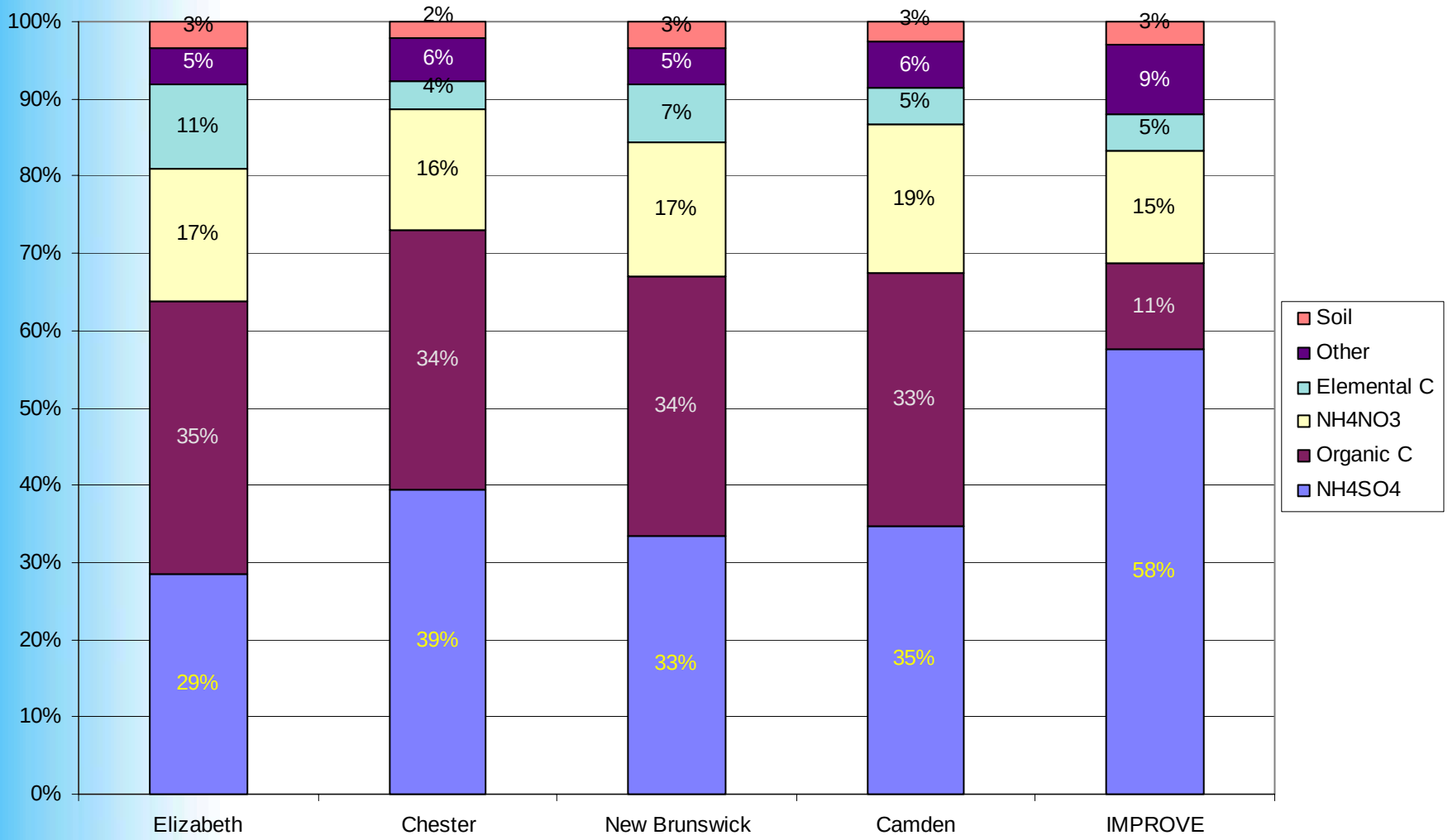
Concentrations of $PM_{2.5}$

66-120 $\mu g/m^3$

Percentages of $PM_{2.5}$ Components During July 2002 Forest Fire Episode



Percentages of $PM_{2.5}$ Components Compared with IMPROVE Data 2001-2003



Interagency Monitoring of Protected Visual Environments (IMPROVE)

- Established in 1985
- Protect visibility at Class 1 areas (national parks and recreation areas)
- Identify chemical species responsible for man-made visibility impairment
- Document trends towards visibility goal
- 30 sites nationwide at Class 1 areas
- 110 other rural locations using IMPROVE protocols
- Aerosol, optical and camera monitoring

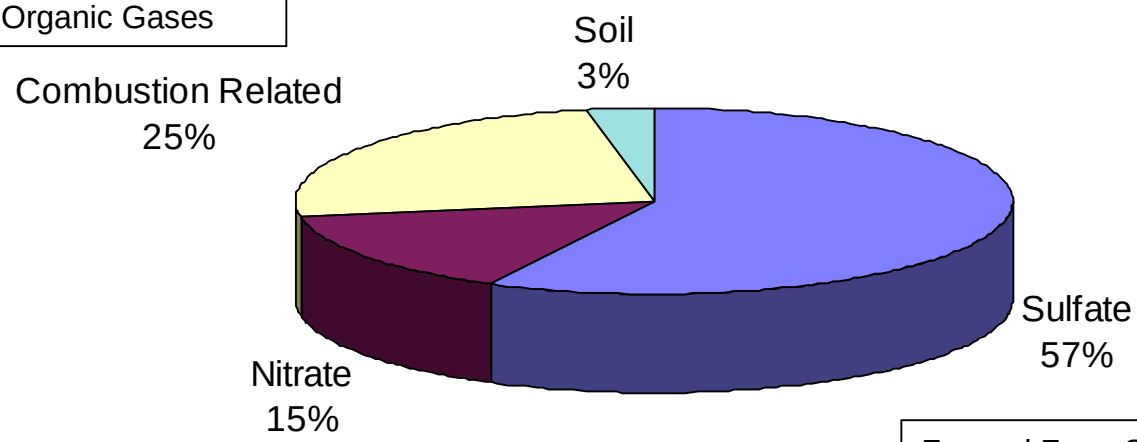
Particles Cause Haze

- Light Scatterers
  - Soils
  - Nitrates
  - Organic Carbon
  - Sulfates
- Light Absorber
  - Elemental Carbon
- Sulfate is Largest Factor in Haze

Composition of Fine Particles Brigantine, N.J.

Diesels - Highway
Diesels - Off Road
Aircraft & Railway
Gasoline Combustion
Incineration, Open Burning
Residential Wood Burning
Structural Fires
Utility/Commercial Fuel Combustion
PM formed from Organic Gases

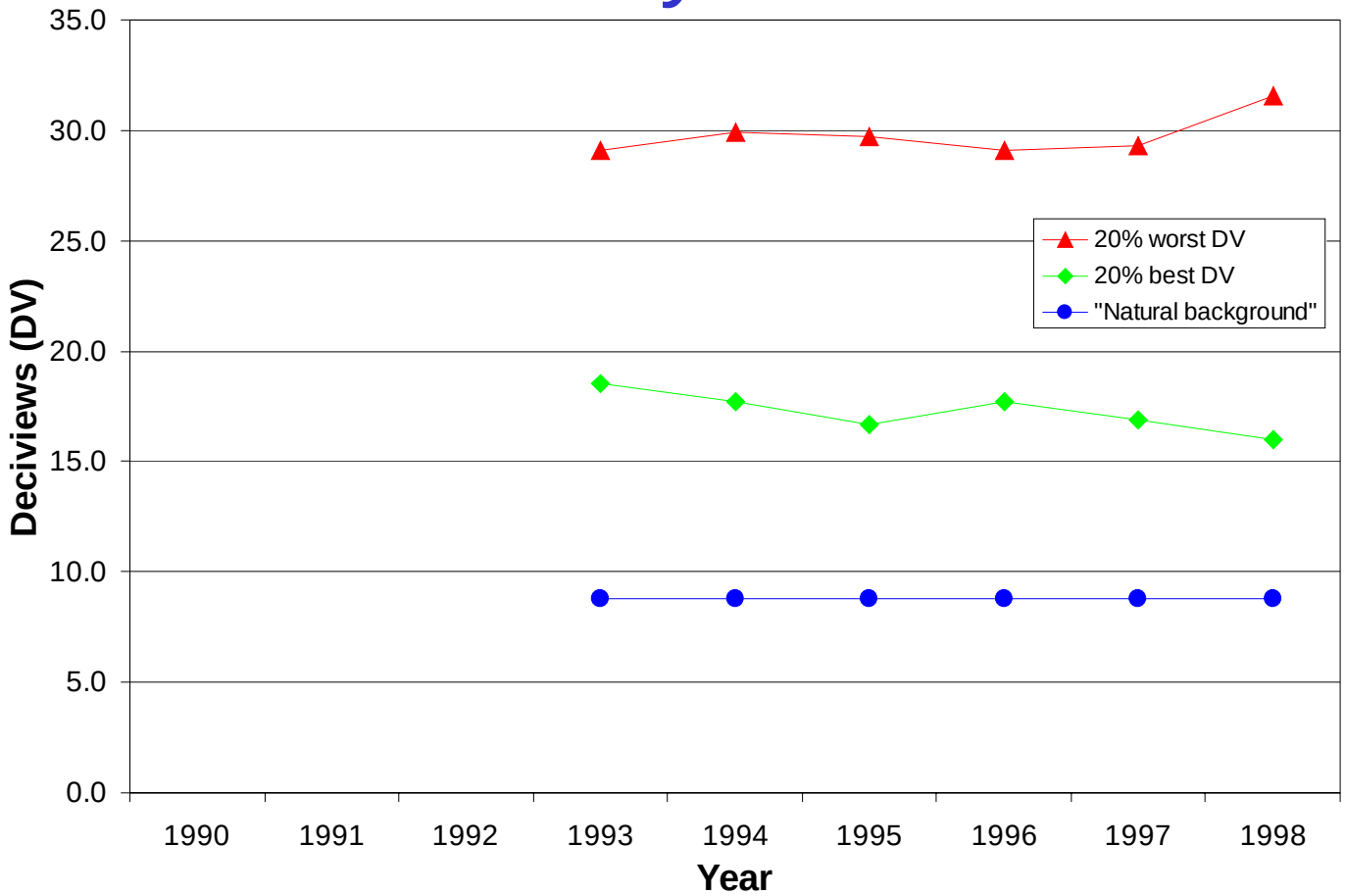
Wind Erosion, Agricultural Tilling, Paved and Unpaved Roads and Construction Activities



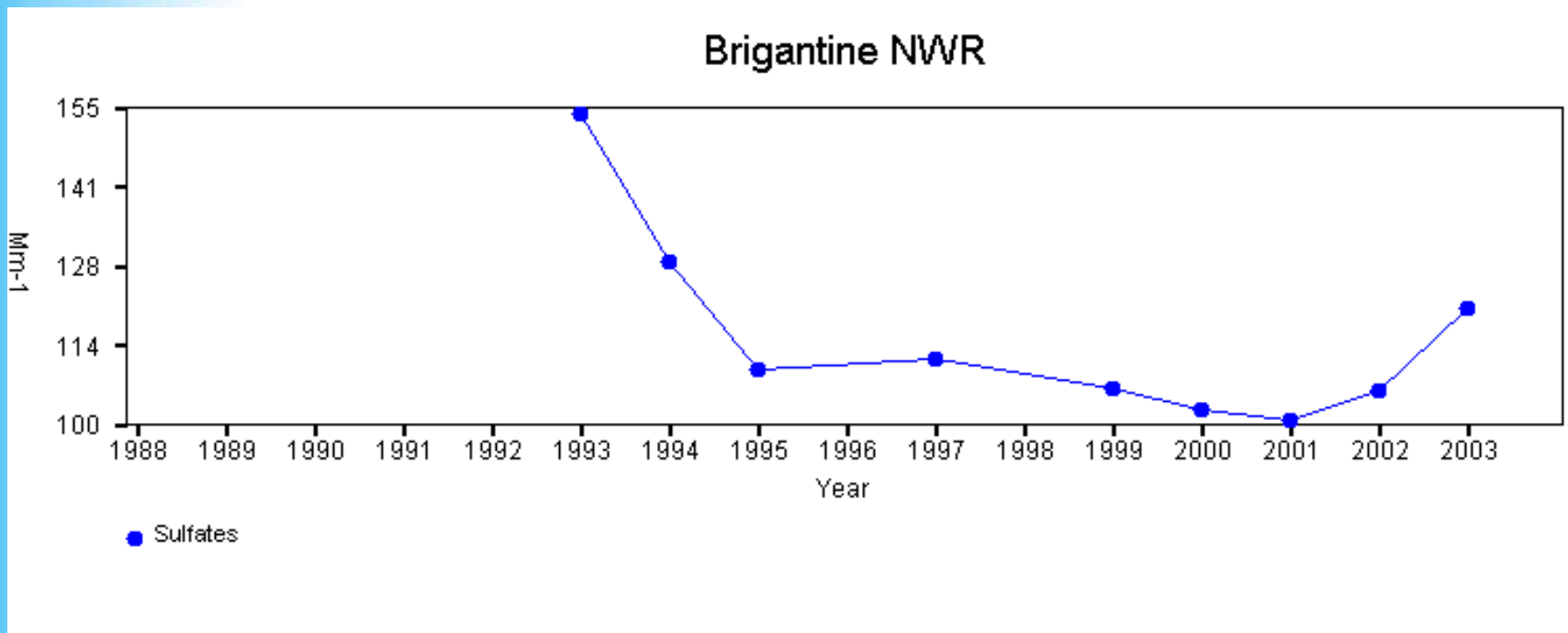
Formed from NOx Emitted From Regional and Local Sources, Highway Vehicles and Off-Road Diesel Mobile Sources, reacting with ammonia

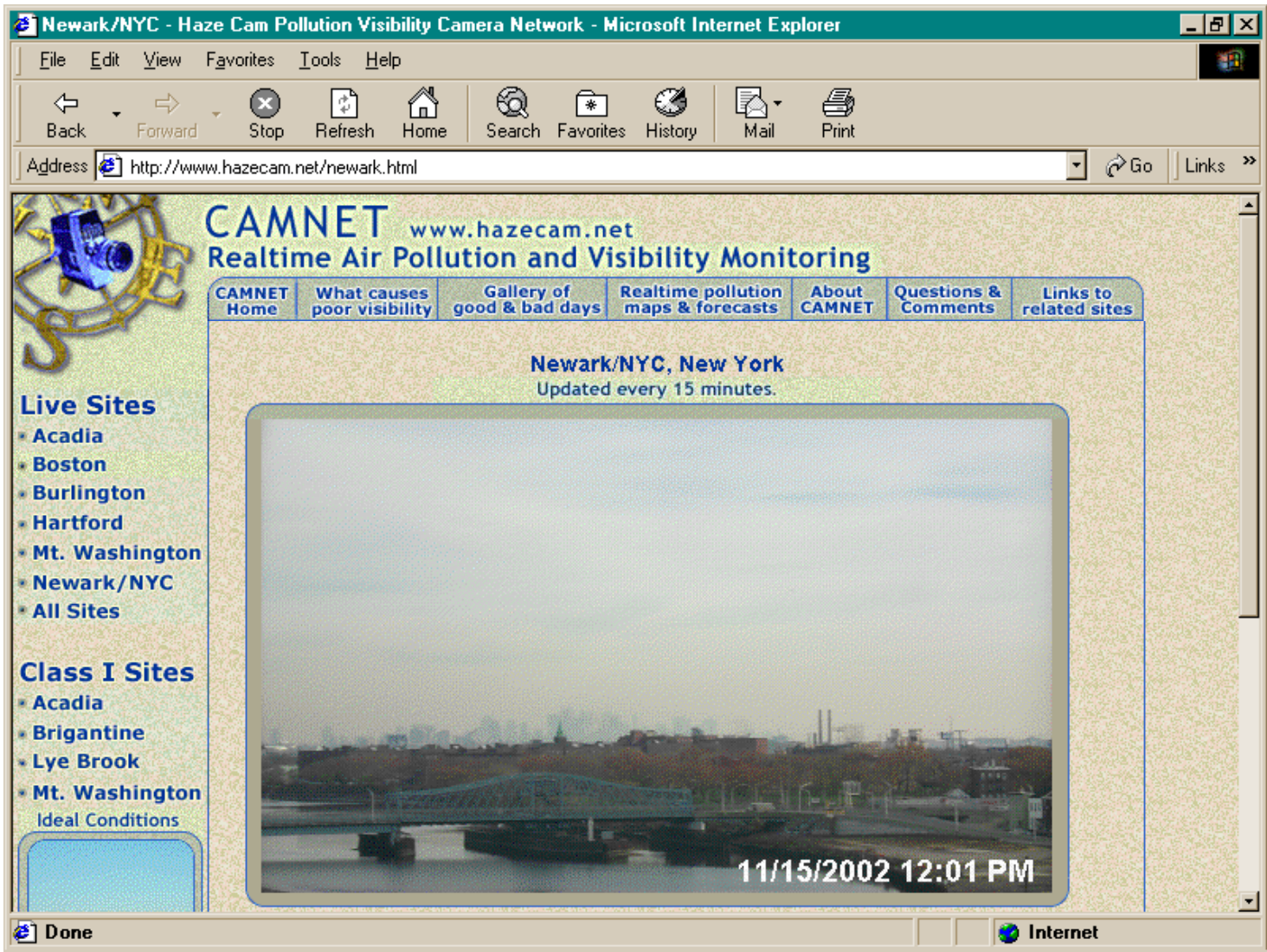
Formed From SO2 Transported from Regional and Local Sources; Oil and Coal-fired Utility and Commercial/ Institutional Boilers, Small Combustion Sources, reacting with Ammonia

Brigantine Wilderness Area Visibility Trends



Trend of Light Extinction Obtained from IMPROVE Database




Newark/NYC - Haze Cam Pollution Visibility Camera Network - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print
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Go Links
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CAMNET Home
What causes poor visibility
Gallery of good & bad days
Realtime pollution maps & forecasts
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Questions & Comments
Links to related sites
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Acadia
Boston
Burlington
Hartford
Mt. Washington
Newark/NYC
All Sites
Class I Sites
Acadia
Brigantine
Lye Brook
Mt. Washington
Ideal Conditions
Newark/NYC, New York
Updated every 15 minutes.
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Internet

Common Issues for Ozone, $PM_{2.5}$ and Regional Haze

- Dominant component is a secondary pollutant
  - Ozone: precursors - VOCs and NO_x
  - $PM_{2.5}$: secondary sulfates and nitrates
  - Regional Haze: secondary sulfates
- Transport
- Transformation from primary to secondary pollutant

For More Information...

- www.state.nj.us/dep/airmon/
- www.hazecam.net